Chapter 21
Configure T3 Interfaces

T3 is the physical layer protocol used by the Digital Signal level 3 (DS-3) multiplexing method in North America. A T3 interface operates at a bit rate of 44.736 Mbps. The JUNOS software supports payload scrambling and subrate operation on each physical T3 interface. One encapsulation format, PPP, Frame Relay, or HDLC, must be configured for the interface. DS-3 standards supported include:

ANSI TI.107, TI.102

GR 499-core, GR 253-core

Bellcore TR-TSY-000009

AT&T Pub 54014

ITU G.751, G.703, G823

To configure T3-specific physical interface properties, include the t3-options statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t3-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (32 | 16);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag value;
}
```

You can configure the following T3 interface-specific properties:

Configure T3 BERT Properties on page 302

Disable C-Bit Parity Mode on page 303

Configure CSU Compatibility Mode on page 303

Configure the Frame Checksum on page 304

For examples of T3 interface configuration, see the following section:

Configure T3 BERT Properties

You can configure a T3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the bert-period, bert-algorithm, and bert-error-rate statements at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

seconds is the duration of the BERT procedure, in seconds. The test can last from 1 to 240 seconds; the default is 10 seconds.

rate is the bit error rate. This can be an integer in the range 0 through 7, which corresponds to a bit error rate in the range 10^{-0} (that is, 1 error per bit) to 10^{-7} (that is, 1 error per 10 million bits).

algorithm is the pattern to send in the bit stream. The algorithm for the E1 BERT procedure is pseudo-2e15-o151 (pattern is $2^{15}-1$, as defined in the CCITT/ITU O.151 standard).

On T3 interfaces, you can also select the pattern to send in the bit stream by including the bert-algorithm statement at the [edit interfaces *interface-name interface*-options] hierarchy level:

```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, see the CLI possible completions, for example:

```
[edit interfaces t3-0/0/0 t3-options]
user@host# set bert-algorithm ?
Possible completions:
all-ones-repeating   Repeating one bits
all-zeros-repeating  Repeating zero bits
alternating-double-ones-zeros  Alternating pairs of ones and zeros
alternating-ones-zeros  Alternating ones and zeros
pseudo-2e10          Pattern is 2^10 - 1
...
```

See individual interface types for specific hierarchy information. For information about running the BERT procedure, see the *JUNOS Internet Softw are Oper ational Mode Command Reference*.

Disable C-Bit Parity Mode

C-bit parity mode controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the FEBE, FEAC, terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. When C-bit parity mode is disabled, the basic T3 framing mode (M13) is used.

By default, C-bit parity mode is enabled. To disable C-bit parity mode and use M13 framing for your T3 link, include the no-cbit-parity statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
no-cbit-parity;
```

To return to the default, enabling C-bit parity mode, delete the no-cbit-parity statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options no-cbit-parity
```

To explicitly enable C-bit parity mode, include the cbit-parity statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
cbit-parity;
```

Configure CSU Compatibility Mode

To configure a T3 interface so that it is compatible with the channel service unit (CSU) at the remote end of the line, include the compatibility statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
```

You can configure the interface to be compatible with a Digital Link, Kentrox, or Larscom CSU.

The subrate of a T3 interface must exactly match that of the remote CSU. To specify the subrate, include the subrate option in the compatibility-mode statement:

For Digital Link CSUs, specify the subrate *value* as the data rate you configured on the CSU in the format *x*Kb or *x.x*Mb. For a list of specific rate values, use the command completion feature in the CLI. The range is 301 Kbps through 44.2 Mbps.

Kentrox CSUs do not support subrate.

For Larscom CSUs, specify the subrate *value* as a number from 1 through 14 that exactly matches the value configured on the CSU.

Configure the Frame Checksum

By default, T3 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment may not support 32-bit checksums.

On a Channelized OC-12 interface, the fcs statement is not supported. To configure FCS on each DS-3 channel, you must include the t3-options fcs statement in the configuration for each channel.

To configure a 32-bit checksum, include the fcs statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the fcs 32 statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the fcs statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 16;
```

Configure FEAC Response

The T3 far-end alarm and control (FEAC) signal is used to send alarm or status information from the far-end terminal back to the near-end terminal and to initiate T3 loopbacks at the far-end terminal from the near-end terminal. To allow the remote CSU to place the local router into loopback, you must configure the router to respond to the CSU's FEAC request by including the feac-loop-respond statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
feac-loop-respond;
```

By default, the router does not respond to FEAC requests.

If you have configured remote or local loopback with the T3 loopback statement, the router does not respond to FEAC requests from the CSU even if you have included the feac-loop-respond statement in the configuration. To have the router respond, you must delete the loopback statement from the configuration.

To explicitly configure the router not to respond to FEAC requests, include the no-feac-loop statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
no-feac-loop-respond;
```

Configure the Idle Cycle Flag

By default, a T3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the idle-cycle-flag statement at the [edit interfaces *interface-name* t3-options] hierarchy level, specifying the ones option:

> [edit interfaces *interface-name* t3-options]
> idle-cycle-flag ones;

To explicitly configure the default value of 0x7E, include the idle-cycle-flag statement with the flags option:

> [edit interfaces *interface-name* t3-options]
> idle-cycle-flag flags;

Configure the Line Buildout

A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 225 feet (about 68 meters), and a long setting, which is greater than 225 feet. By default, the interface uses the short setting.

The long-buildout and no-long-buildout statements apply only to copper-cable-based T3 interfaces. You cannot configure a line buildout for a DS-3 channel on a Channelized OC-12 interface, which runs over fiber-optic cable. If you configure this statement on a Channelized OC-12 interface, it is ignored.

To have the interface drive a line that is longer than 255 feet, include the long-buildout statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

> [edit interfaces *interface-name* t3-options]
> long-buildout;
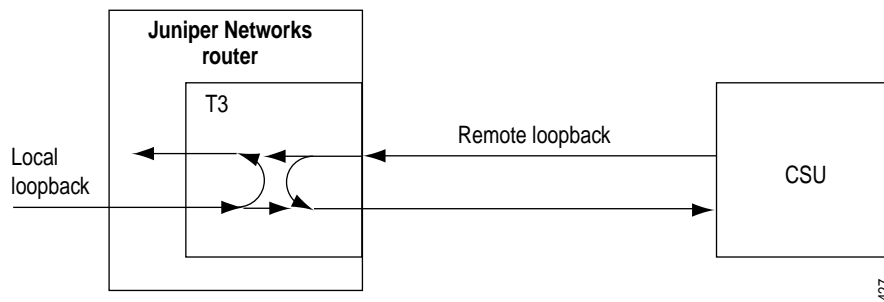
To explicitly configure the default short line buildout, include the no-long-buildout statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

> [edit interfaces *interface-name* t3-options]
> no-long-buildout;

Configure Loopback Capability

You can configure loopback capability between the local T3 interface and the remote CSU, as shown in Figure 21. You can configure the loopback to be local or remote. With local loopback, the T3 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the T3 interface but also are immediately retransmitted to the CSU.

Figure 21: Remote and Local T3 Loopback

To configure loopback capability on a T3 interface, include the loopback statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
loopback (local | remote);
```

Packets can be looped on either the local router or the remote CSU. To turn off loopback, remove the loopback statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options loopback
```

For DS-3 channels on a Channelized OC-12 interface, the SONET loopback statement is supported only for channel 0. It is ignored if included in the configuration for channels 1 through 11. The SONET loopback configured for channel 0 applies to all 12 channels equally. To configure loopbacks on the DS-3 channels, you must include the t3-options loopback statement in the configuration for each channel. Each DS-3 channel can be put in loopback mode independently.

Configure HDLC Payload Scrambling

T3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

On a Channelized OC-12 interface, the SONET payload-scrambler statement is ignored. To configure scrambling on the DS-3 channels on the interface, you can include the t3-options payload-scrambler statement at the [edit interfaces *interface-name* t3-options] hierarchy level for each DS-3 channel:

```
[edit interfaces interface-name t3-options]
payload-scrambler;
```

To explicitly disable HDLC payload scrambling, include the no-payload-scrambler statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
no-payload-scrambler;
```

To disable payload scrambling again (return to the default), delete the payload-scrambler statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options payload-scrambler
```

Configure the Start End Flags

By default, a T3 interface waits two idle cycles between sending start and end flags. To configure the interface to share the transmission of start and end flags, include the start-end-flag statement at the [edit interfaces *interface-name* t3-options] hierarchy level, specifying the shared option.

```
[edit interfaces interface-name t3-options]
start-end-flag shared;
```

To explicitly configure the default of waiting two idle cycles between the start and end flags, include the idle-cycle-flag statement with the filler option:

```
[edit interfaces interface-name t3-options]
start-end-flag filler;
```

Examples: Configure T3 Interfaces

T3 interfaces can use PPP, Cisco HDLC, or Frame Relay encapsulation.

The following example configures PPP encapsulation on a DS-3 PIC:

```
[edit]
interfaces {
    t3-fpc/pic/port {
        encapsulation ppp;
        t3-options {
            no-long-buildout;
            compatibility-mode larscom;
            payload-scrambler;
        }
        unit 0 {
            family inet {
                address 10.0.0.1/32 {
                    destination 10.0.0.2;
                }
            }
            family iso;
        }
    }
}
```

The following example configures Cisco HDLC encapsulation on a DS-3 PIC:

```
[edit]
interfaces {
    t3-fpc/pic/port {
        encapsulation cisco-hdlc;
        t3-options {
            no-long-buildout;
            compatibility-mode larscom;
            payload-scrambler;
        }
        unit 0 {
            family inet {
                address 10.0.0.1/32 {
                    destination 10.0.0.2;
                }
            }
            family iso;
        }
    }
}
```

The following examples illustrate how to configure Frame Relay encapsulation on two routers, where one router is a DTE device and the other is a DCE device:

On DTE Router:

```
[edit]
interfaces {
    t3-fpc/pic/port {
        encapsulation frame-relay;
        t3-options {
            no-long-buildout;
            compatibility-mode larscom;
            payload-scrambler;
        }
        unit 1 {
            dlci 1;
            family inet {
                address 10.0.0.1/32 {
                    destination 10.0.0.2;
                }
            }
            family iso;
        }
        unit 2 {
            dlci 2;
            family inet {
                address 10.0.0.3/32 {
                    destination 10.0.0.4;
                }
            }
            family iso;
        }
    }
}
```

On DCE Router:

```
[edit]
interfaces {
    t3-fpc/pic/port {
        dce;
        encapsulation frame-relay;
        t3-options {
            no-long-buildout;
            compatibility-mode larscom;
            payload-scrambler;
        }
        unit 1 {
            dlci 1;
            family inet {
                address 10.0.0.2/32 {
                    destination 10.0.0.1;
                }
            }
            family iso;
        }
        unit 2 {
            dlci 2;
            family inet {
                address 10.0.0.4/32 {
                    destination 10.0.0.3;
                }
            }
            family iso;
        }
    }
}
```